Amend the Specification as follows:

[0015] Sensor 11 illuminates and images a target area 17. Light between sensor 11 and target area 17 travels along a light path 14. Sensor 12 illuminates and images a target area 18. Light between sensor 12 and target area 18 travels along a light path 15. Sensor 13 illuminates and images a target area 19. Light between sensor 13 and target area 19 travels along a light path 16. Processing software ~~22~~ 20 is used to process images captured from the targets and compare the images with stored images to produce displacement coordinates for each target. Processing software ~~22~~ 20 then translates displacement coordinates for the targets into absolute position coordinates for stage 10, measured from a reference location. Portions of processing software ~~22~~ 20 can reside within sensors 11, 12 and 13. Alternatively, processing software ~~22~~ 20 used for image processing can be located completely outside sensors 11, 12 and 13 and in a separate processing system.

[0017] Imaging chip 22 is for example, a complementary metal-oxide semiconductor (CMOS) imager or a charge coupled device (CCD) array or another type of imaging hardware or camera. Processing software ~~22~~ 20 can be partially located within imaging chip 22. Alternatively, processing software 22 used for image processing can be located completely outside imaging chips and in a separate processing system.

[0023] In a block 74, the displacement coordinates reported by all of sensors 11, 12 and 13 are translated to calculate position coordinates for stage ~~50~~ 10 in the six degrees of freedom.

[0024] Fig. 6 shows a simplified embodiment of the present invention used to describe a typical algorithm used to translate the displacement coordinates for the three targets into stage motion coordinates in the six degrees of freedom. A stage 50 includes a target plane 57 located on one corner of stage 50. The area of target plane 57 is exaggerated and brought to a corner of stage 50 (from a small interior distance) for the purpose of simplifying the viewing of target plane 57. Stage 50 also includes a target plane 58 located on another corner of stage 50 and a target plane 59 located on another corner of stage 50. The areas of target plane 58 and target plane ~~58~~ 59 are also exaggerated and brought to corners of stage 50 (from a small

2

interior distance) for the purpose of simplifying the viewing of target plane 58 and target plane 59, respectively.

[0030] Three dimensional translational movement (dx, dy, dz) and three dimensional rotational movement (dR_x, dR_y, dR_z) of stage 50 cause target plane 58 to move a total ~~of Δx~~ $\underline{\Delta x_1}$, Δy_1, Δz_1 respectively along the x, y and z axes. The movement manifests in a change of target co-ordinates readings of ΔW_1 and ΔV_1 as follows:

$$\Delta W_1 = \alpha \Delta x_1 - \alpha \Delta y_1$$

$$\Delta V_1 = \beta \Delta x_1 - \beta \Delta y_1 - 2\beta \Delta z_1$$

Where $\alpha = \sqrt{2}/2$ and $\beta = \sqrt{6}/6$

[0034] Cascading by matrix multiplication, changes in the six target co-ordinates $(\Delta W_1, \Delta V_1, \Delta W_0, \Delta V_0, \Delta W_2, \Delta V_2)$ can be obtained from the six stage movements $(dx, dy, dz, dR_x, dR_y, dR_z)$ as set out in Table 2 below:

Table 2

$$\begin{bmatrix} \Delta W_1/\alpha \\ \Delta V_1/\beta \\ \Delta W_0/\alpha \\ \Delta V_0/\beta \\ \Delta W_2/\alpha \\ \Delta V_2/\beta \end{bmatrix} = \begin{bmatrix} -1 & -1 & 0 & -Z & Z & X+Y \\ 1 & -1 & -2 & -(2Y+Z) & -(2X+Z) & X-Y \\ -1 & 1 & 0 & \underline{Z} & Z & X+Y \\ -1 & -1 & -2 & -(2Y+Z) & 2X+Z & -X+Y \\ 1 & 1 & 0 & Z & -Z & X+Y \\ -1 & 1 & -2 & 2Y+Z & 2X+Z & X-Y \end{bmatrix} * \begin{bmatrix} dx \\ dy \\ dz \\ dR_x \\ dR_y \\ dR_z \end{bmatrix}$$

3